**WELDING PROCEDURE SPECIFICATION**

**WPS:** 2010-XXTT-1grp3  
**REV. NO.:** 0  
**DATE:** 3/29/2018  
****APPLICABILITY**

**WELDING PROCESS:** GTAW and GTAW  
**CODE:** ASME IX and Sec. VIII Div 3  
**OTHER:** AWS D1.1

**JOINT:** This WPS shall be used in conjunction with the General Welding Standards (GWS) and Welding Fabrication Procedure (WFP) sections and criteria for joint details, repairs, NDE, inspection, etc.

**Weld Joint Type:** Groove & Fillet  
**Class:** Full & Partial Penetration & Fillets

**See GWS 1-06 and WFP’s for joint details.**

**Root Opening:** N/A  
**Backing:** Optional

**Backgrd Root:** When required  
**Back Mat:** None

**Backgrd Method:** Gouge, Chip, Grind  
**GTAW Flux:** N/A

**JOINT:** This WPS shall be used in conjunction with the General Welding Standards (GWS) and Welding Fabrication Procedure (WFP) sections and criteria for joint details, repairs, NDE, inspection, etc.

**Filler Metals:**

<table>
<thead>
<tr>
<th>A No.</th>
<th>SFA Class:</th>
<th>F No.</th>
<th>Size:</th>
<th>Weld Metal Thickness Ranges:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.28 and 5.28</td>
<td>6 and 6</td>
<td>.045 .062 .045 .062</td>
<td>AWS Root Pass: .125 thru 8.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AWS Balance: .125 thru 8.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASME Root Pass: .187 thru 3.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASME Balance: .187 thru 3.00</td>
</tr>
</tbody>
</table>

**BASE MATERIAL:**

<table>
<thead>
<tr>
<th>P No.</th>
<th>Gr No.:</th>
<th>to P No.:</th>
<th>Gr No.:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

**Qualified Pipe Dia. Range:** >= AWS: 24  
**Qualified Thickness Range:** >= AWS: 0.125 thru 8  
**ASME: 0.187 thru 3**

**QUALIFIED POSITIONS:**

<table>
<thead>
<tr>
<th>AWS:</th>
<th>ASME:</th>
<th>Vert. Prog.:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1G, 3G</td>
<td>1G, 3G</td>
<td>Up</td>
</tr>
</tbody>
</table>

**Preheat Min. Temp.:** 225  
**Interpass Max. Temp.:** 300 °F  
**Preheat Maintenance:** 275 °F  
**PWHT: Time @ °F Temp.:** N/A  
**Temperature Range:** N/A °F to N/A °F

**Backin Gas/Comp:** N/A N/A

**WELDING CHARACTERISTICS:**

**Current:** DCEN and DCEN  
**Ranges:** Amps: 180 to 245  
**Volts:** 18 to 23

**Tungsten Type:** EWLA-1.5  
**Tungsten Dia.:** 3/32 to 1/8

**Transfer Mode:** N/A  
**Pulsing Cycle:** N/A

**Background Current:** N/A

**Fuel Gas:** N/A  
**Flame:** N/A

**Braze Temp °F:** N/A to N/A

**BRAZING TECHNIQUE:** For fabrication specific requirements such as fitup, cleaning, grinding, PWHT and inspection criteria, refer to Volume 2, Welding Fabrication Procedures.

**Technique:** Manual  
**Cleaning Method:** Chip/grind/file/wire brush

**Oscillation:** 3X

**GMAW Gun Angle:** 10 ° to 20 °

**GMAW/FCAW Tube to Work Distance (in):** N/A

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Maximum K/J Heat Input: 50 KJ/in
Travel Speed: N/A
Gas Cup Size: 3/8 - 5/8

PROCEDURE QUALIFIED FOR:
Charpy "V" Notch: Yes
Nil-Ductile Transition Temperature: No
Dynamic Tear: Yes

Comments: Note: This WPS is run with GTAW Tip Tig
This PQR was run on two plates to collect all required samples. DT average 90.88 ftlb @-200 F CVN = 27 ftlbs @ 0F and 27 ftlbs @ -20F

<table>
<thead>
<tr>
<th>Weld Layer</th>
<th>Manual Process</th>
<th>Filler Metals</th>
<th>Size</th>
<th>Amp Range</th>
<th>Volt Range</th>
<th>Travel/ipm</th>
<th>Nozzle Angle</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GTAW</td>
<td>ER80S-D2</td>
<td>.045</td>
<td>180 to 185</td>
<td>18</td>
<td>3 to 6</td>
<td>10 to 20</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>GTAW</td>
<td>ER90S-D2</td>
<td>.062</td>
<td>190 to 195</td>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>GTAW</td>
<td>ER90S-D2</td>
<td>.045</td>
<td>200 to 205</td>
<td>3</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>GTAW</td>
<td>ER90S-D2</td>
<td>.062</td>
<td>210 to 220</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

REM. * Weld layers are representative only - actual number pf passes and layer sequence may vary.
ML-1/2 projects or jobs must determine if the supporting documentation for this WPS complies with quality requirements of the project/job.
Use of LANL Welding Procedures and Welder Qualifications for non-LANL work shall be at the sole risk and responsibility of the Subcontractor, and the Subcontractor shall indemnify and save LANL and the Government harmless from any and all claims, demands, actions or causes of action, and for any expense or loss by the reason of Subcontractor's and their employees possession and use of LANL procedures and qualifications.

APPROVAL: Signatures on file at ES-DE
DATE: 4/4/2018